Northwest and Alaska Fisheries Center

National
Marine Fisheries
Service

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PENNSYLVANIA STATE UNIVERSITY
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DOCUMENTS COLLECTION

The NORTHWEST AND ALASKA FISHERIES CENTER—with headquarters in Seattle, Washington—is one of four research centers of the National Marine Fisheries Service (NMFS), NOAA. The Center plans, develops, and manages programs designed for better comprehension of the living marine resources of the sea, such as crabs, fishes, seals, and whales. The Center also recommends actions for their utilization, conservation, or protection, consistent with national needs and goals.

Another principal function of the Center is to serve as technical advisor to: (1) the Northwest Regional Office and Alaska Regional Office, NMFS; (2) the North Pacific and Pacific Fishery Management Councils; and (3) U.S. Commissions or groups involved in fisheries negotiations with foreign countries.

The Center's activities extend over a vast oceanic area as well as the coasts and inland waters of Washington, Oregon, Idaho, and Alaska. Research is undertaken on the marine life in the waters of the northeastern Pacific Ocean (including the Bering Sea and Gulf of Alaska) and off the west coast of Canada. Research is also conducted in coastal, estuarine, and river areas to examine their role in production of marine animals and vegetation.

The Center is staffed by professionals in biological and physical sciences in addition to statisticians, computer experts, chemists, and economists. Administrative support is provided in accounting, budgeting, personnel, procurement, program planning, and public affairs.

The Center's objective is carried out through seven divisions of the Seattle Laboratory. The Auke Bay Laboratory is located in Alaska. Field stations are located at Kodiak, Alaska, and along the Columbia River and Puget Sound. The Center also jointly operates and conducts research (with Oregon State University) at the Newport Aquaculture Facility.

Resource Ecology and Fisheries Management Division

The Resource Ecology and Fisheries Management Division (REFM) assists the Pacific Fishery Management Council and the North Pacific Fishery Management Council, established by the Fishery Conservation and Management Act of 1976, in management of the fishery resources within the 200-mile fishery conservation zone in the northeastern Pacific Ocean and Bering Sea.

Scientists study the ecology, population dynamics, and exploitation of marine resources in the area. They determine levels of harvest that commercially fished species can sustain without affecting their reproductive capacity. Their ultimate goal is to develop and evaluate alternative management strategies to maintain commercially important fisheries.

Another major activity is the administration of a foreign fisheries observer program. All foreign vessels fishing within the 200-mile fishery conservation zone are required to provide accommodation for a U.S. observer if requested by the U.S. In 1979, 163 observers gathered information aboard foreign fishing vessels from waters off northern California northward to the Bering Sea. In addition to providing a check on the accuracy of the catches reported by foreign governments, observers also monitor the incidental catch of species whose retention is prohibited and report on suspected violations of U.S. regulations.

While aboard, the observer records the location, duration, and landed weight of each haul or longline set. He (she) samples the catch to determine species composition, length, weight, and other biological information for commercially important species.

A major effort of the Division is directed at obtaining a broad base of biological and physical oceanographic data with which to supplement the collections of fisheries information. Particular emphasis is focused on the food-chain and on the time-space variations in the physical-chemical properties and current systems in the marine environment.

The basic data bank is further enhanced with contributions about marine mammals and seabirds. The entire pool of data is grist for another of the Division's large undertakings—the forward-looking ecosystems modeling program. This project attempts to ascertain and predict the consequences of manipulating harvests of particular species based on the interaction with the productivity of other species in the ecosystem.

Finally, the socioeconomic research program is designed to develop information and tools which will help determine how and to what extent fishermen and consumers are affected by management decisions. Concern is also focused on isolating implementation costs of various management measures.

Resource Assessment and Conservation Engineering Division

Marine fish and shellfish populations of potential commercial importance are studied by Division (RACE) scientists. These populations consist of bottomfish (e.g., cod, Pacific whiting [hake], flatfish, pollock) or open-sea (pelagic) dwellers (herring, smelt, capelin, squid) as well as shellfish (Alaskan king and snow [Tanner] crabs, shrimp, and clams) that occur in offshore waters from northern California northward to Alaska. Many of these populations are intensely fished by both U.S. and foreign fishermen.

Research personnel determine how abundant these animals are and whether their abundance is increasing or declining.

Crab, shrimp, and most bottomfish are sampled, using commercial fishing trawls which are dragged along the sea bottom. Sampling is done in a statistical manner so that estimates of the number and weight of animals of a given species can be obtained. Pelagic fish are sampled with large midwater trawls that can be positioned in the water where the fish have been located by hydroacoustical (sounding) devices. For clams, dredges are used; and for some animals (like sablefish), traps or longline gear are fished on the sea bottom.

Other biological data are collected that indicate the age and size composition of the fish and shellfish, how rapidly the animals grow, where and when they reproduce, as well as their rate of survival.

The information is used by various groups: fishery managers to set fishery regulations such as catch quotas, seasonal closures, and size limitations; scientists involved in the protection of the environment (e.g., from pollution and other deleterious activities) and endangered species (e.g., some seals and whales); and commercial fishermen and processors in their planning and operations.

Environmental Conservation Division

Environmental Conservation Division (EC) research is carried out with the aim of elucidating the nature, fate, and effects of the myriad chemical pollutants in the marine environment. These include petroleum hydrocarbons, synthetic organics (e.g., PCB's and other chlorinated hydrocarbons), and metals. Disciplines such as biology, chemistry, biochemistry, physiology, microbiology, toxicology, and pathology are applied to tie together causes and effects.

Invertebrates and vertebrates are studied, with emphasis on commercially important species of the Pacific Northwest and Alaska regions.

Accumulation, biotransformation, and retention of environmental contaminants in marine organisms are studied in conjunction with effects of pollutant-exposure on susceptibility to disease, behavior, cellular and subcellular abnormalities, pathological incidences, and survival.

Analytical capabilities of the Division are enhanced by the NOAA National Analytical Facility (NAF). Foremost among NAF services is the capability to measure and identify contaminants at low levels found in environmental samples.

Utilization Research Division

Utilization Research is concerned with fishery resources from catch to consumption. A guiding principle of utilization is that wise use of our commercial fishery resources can be achieved best through application of preservation and process methods appropriate to each fishery. The objective is to provide the knowledge that will assist and encourage the industry to produce for consumers in both the U.S. and foreign countries a wide variety of fishery products of high quality and acceptability at a reasonable price and economic return.

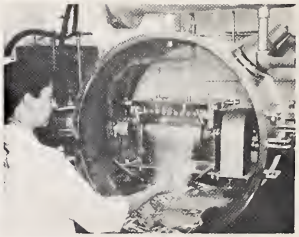
In the past decade demand for seafoods, especially the convenience foods for quick preparation like breaded fish portions and the premium foods like crab and shrimp, has increased substantially in both the U.S. and Europe. At present the traditional coastal fisheries for cod, haddock, salmon, halibut, sole, ocean perch, herring, shrimp, crab, and clams have been fully developed. New resources are necessary for an expanded fishing industry. The result has been a large increase in use of neglected or underutilized species that have been long ignored by fishermen and processors because of problems in handling, preserving, and processing.

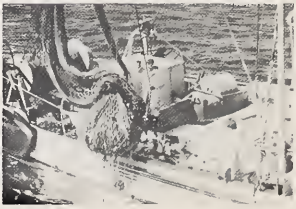
In the Pacific Northwest and Alaska fisheries, these neglected species include Pacific whiting (hake), many of the rockfish species, walleye (Alaska) pollock, sablefish, arrowtooth and starry flounder, as well as several species of soles and flounders from the Gulf of Alaska and the Bering Sea.

Of first importance are the studies on handling and preservation of problem species aboard vessel and in the pilot plant. Secondly but of equal importance are laboratory studies on quality and acceptability factors, chemical and microbiological changes in the fresh and frozen fish, and new and improved concepts for processing and utilization. Laboratory investigations also include the basic differences and composition of the muscle of various species, the characteristics of the proteins, chemistry of post-mortem changes, and new concepts for using difficult-to-process species in a variety of food systems as primary protein ingredients.

Research on the quality of products from traditional and underutilized species is a continuing major activity. Chemical research includes basic nutritional composition and levels, in addition to health significance, of microconstituents occurring naturally, such as the trace mineral elements, and organic constituents from the environment, such as polychlorinated biphenyls (PCB). Microbiological research on pathogens in fish is a second part of this program and emphasizes factors determining growth of *Clostridium botulinum*, potential toxin formation, and application of findings to assure quality in processing of smoked and other fishery products.

A small but important research project in aquaculture is concerned with the development of nutritionally adequate fish feeds, whose cost is consistent with the economic return, and an investigation of fish diseases of infectious and nutritional origin.





National Marine Mammal Laboratory

The National Marine Mammal Laboratory is the principal laboratory responsible for conducting research on marine mammals. Responding to international commitments and national goals and objectives of the Marine Mammal Protection Act and the Endangered Species Act, laboratory programs deal with a broad spectrum of species of whales, porpoises, sea lions, and seals, and subject matter including population dynamics, migrations, distribution, as well as behavior and trophic relationships. In recent years, major program emphasis of the NMML has centered on the bowhead, gray, and humpback whales, Dall's porpoise, and northern fur seal.

Bowhead whale

Because the bowhead is the principal subsistence animal for Alaskan north slope Eskimos but, at the same time, one of the most endangered species of large whales, there is a national requirement to provide for Eskimo subsistence needs without further endangering the species. Consequently it has been a major item of research since 1978. Emphasis of the work is on assessment of the population, including annual censusing of the whales migrating past Barrow, Alaska; monitoring and biological sampling of whales taken by the Eskimos; and studies of the population dynamics, life history, and trophic requirements of the population. Results of research are analyzed and used in developing domestic regulations and are also provided for consideration by the International Whaling Commission (IWC) which meets annually to establish international whale conservation regulations and harvest quotas on all species of large whales.

Northern fur seal

As a party to the four-nation International North Pacific Fur Seal Commission, the United States is responsible for managing the major segment of the herd associated with the Pribilof Islands of Alaska (approximately 1.25 million animals). The research element has been conducted by the NMML and its predecessor organizations, for several decades. In recent years program emphasis has been on the dynamics of the population, that is, examination of changes in population structure with changes in density of the population as a whole or of the various components of the population.

St. George, one of the two main islands of the Pribilof group, was declared a research sanctuary with no commercial harvest in 1973. Intensive studies have been carried out there since 1974, on fur seal behavior and movements, including some radio tracking efforts to better define the feeding movements of the major population components.

Other species

Similar studies are conducted on Dall's porpoise in response to agreements under the International North Pacific Fisheries Commission, on other large whales to provide needed information for effective conservation and management by the IWC, and on a variety of pinniped species under statutory responsibility of the Marine Mammal Protection Act. As a result, NMML biologists find themselves recording whale sightings throughout the North Pacific region, from the shores of Japan to the ice edge in the Chukchi Sea; and counting seal pups on rookeries from the remote Aleutian Islands to the Hawaiian Leeward's.

Office of Fisheries Information Systems

The Office of Fisheries Information Systems administers a computer network to provide automatic data processing (ADP) and fisheries information services to the Alaska and Pacific Northwest regions. The computer network is composed of a Burroughs B7811 computer system in Seattle and two Burroughs B2835 computer systems in Alaska—one in Juneau and the other in Kodiak. These two medium computers operate as independent systems but are linked, via telecommunications lines, to the master computer in Seattle.

The computer network is used to process and analyze information collected from various sources dealing in fishery, oceanography, marine mammal, and environmental research. Such research involves "sifting" through large volumes of data and to synthezise manageable and comprehensible information for developing policies and strategies as in fisheries management in the 200-mile U.S. fishery conservation zone.

The computer network also serves to communicte data and analyses expeditiously throughout the Pacific Northwest, Alaska, and other parts of the nation.

Another major function of the Office is the development and administration of fisheries data archival and retrieval systems. These information systems are being developed to allow efficient and instantaneous retrieval of information to support fisheries research and management needs. The data bases involved are: (1) the foreign fisheries catch-effort data of Japan, U.S.S.R., Republic of Korea, Poland, and Taiwan in the Bering Sea, Gulf of Alaska, and off Washington-northern California; (2) the biological (length-weight-age) data of these foreign fisheries; (3) the Japanese high-seas salmon fisheries in the Bering Sea; (4) the U.S. observer data on catch effort and biological data collected aboard foreign fishing vessels within the 200-mile zone; (5) the fishing fleet composition and fishing location of the foreign fleet; (6) U.S. and foreign fisheries data collected during research cruises; and (7) many others including oceanographic features and other marine resources.

Coastal Zone and Estuarine Studies Division

Two of the most important water resource complexes in the western United States are the Columbia River and Puget Sound. Both are habitats for aquatic species which are the objectives of major commercial and recreational fisheries: salmon, steelhead, oysters, shrimp, and crab. The Coastal Zone and Estuarine Studies Division (CZES) provides information leading to their protection, development, and balanced growth. Research is separated among three areas:

Ecological effect of dams

Dams on the Columbia River watershed have severely changed ecological conditions in the downstream sreas, causing a loss of over 50% of the spawning and nursery habitats of important fisheries.

Rapid acceleration of powerhouse construction in response to the energy crisis is creating a river situation which causes a much greater percentage of juvenile salmon and trout migrating to the ocean to pass through turbines where they are injured or killed. Research has developed practical steps to minimize fish losses due to dams, such as: transporting juveniles around hazardous areas, controlling spill to enhance migrant passage, in addition to designing turbine intake screens and safe bypasses to reduce entrainment into the turbines.

Habitat investigations

The Columbia River estuary (covering about 150 square miles and extending from the ocean inland to about river mile 46) is an extremely important and complex area involving a variety of biological and physical interactions, in addition to deleterious human activities (dredging, industrial development, pollution, etc.) and natural changes (the eruption of Mount St. Helens). Scientists monitor the biological effects of changes and predict the consequences of contemplated actions.

Fisheries enhancement

Research is carried out in Puget Sound, an inland sea with 2,300 miles of shoreline and rich in fish, shellfish, aquatic plants, and fishery-based recreational activities. There is a considerable potential for increasing production in this area. Scientists provide leadership in application of controlled rearing of aquatic organisms, such as salmon, to increase production for commercial and recreational uses.

The technology being developed for salmon aquaculture has many applications by public and private growers. Included are the development and improvement of freshwater and saltwater rearing systems, detection and prevention of disease, better nutrition, reduced production costs, increased survival, and development of technology for culture of fishes other than salmon and steelhead trout.

Data have been developed which indicate to hatchery personnel the readiness of juvenile salmon and steelhead for life in saltwater to increase the survival rate for ultimate return as adults.

Fisheries Data and Management Systems Division

The Fisheries Data and Management Systems Division (FDMS) provides technical support to the Center's research scientists in the areas of mathematics/statistics, editing/graphics, and library services.

Mathematics/statistics

Design of experiments and analyses of resulting data which are adequately based in statistical theory form the basis for accurately interpreting experimental results. To this end, staff statisticians work closely with fishery scientists in the Center's multidisciplinary approach to solving fishery problems.

Editing/graphics

Technical editors and graphic designers assist scientists in conveying results of research in a clear, concise fashion to technical and lay audiences.

Library services

Library references and literature searches by staff librarians provide scientists with background information needed in their development of research planning. The Center's library holdings include popular, as well as scientific, fisheries, and biochemical literature. These resources are available for use by the public as well as the Center's scientific staff.

Auke Bay Laboratory

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In 1955, our biologists began studying problems related to Alaskan fishery resources. Since 1960, these studies have been headquartered at the Center's Auke Bay Laboratory in southeastern Alaska.

Enhancement of salmon resources

Between the 1930's and the 1970's, the annual U.S. harvest of Pacific salmon declined from 600 million pounds to about 200 million pounds. By the late 1970's, catches had increased to about 400 million pounds. Variations in these harvests are primarily caused by fluctuations in Alaskan salmon stocks. Presently, aquaculture groups are interested in methods of enhancing the natural production of salmon to eliminate some of this fluctuation.

To assist these aquaculture groups, scientists at the Auke Bay Laboratory and at two experimental hatcheries are developing improved techniques for producing high-quality salmon fry and smolts for ocean release. Also, the scientists are trying to determine what causes fluctuations in the ocean survival of both hatchery and wild stocks.

Development of fishery resources within the 200-mile fishery conservation zone

Over 4 billion pounds of fish and shellfish can be harvested annually from the waters within the 200-mile fishery conservation zone adjacent to Alaska. Management of this extremely valuable renewable resource is now the responsibility of the National Marine Fisheries Service.

Large quantities of groundfish are present in the northeastern Pacific ocean and eastern Bering Sea—the development of a fishing industry there is attracting much attention. At the Auke Bay Laboratory, scientists are studying rockfish, walleye pollock, Pacific herring, sablefish, and flatfish to determine nursery areas and variations in year-class abundance of juvenile fish. These variations will be related to environmental factors and changes in abundance of other species; fishery managers will then determine the number of fish that can be safely taken from the fishery. One result of these studies has been the discovery that the rocky, coastal waters off southeastern Alaska are habitats for juvenile Pacific ocean perch and other rockfishes. This finding establishes the importance of this region as a nursery area.

Pacific salmon constitute one of the more valuable fisheries in the northeastern Pacific Ocean and Bering Sea. Here, U.S. salmon mix with salmon from the U.S.S.R., Japan, and Canada. Some U.S. salmon are caught by foreign fishing fleets; scientists at Auke Bay Laboratory are conducting studies to determine how many U.S. salmon are taken. Information on country of origin is obtained from tagging experiments, analysis of scales taken from fish, and blood characteristics of fish. The results of these studies are used in international negotiations to minimize the catch of U.S. salmon by fishermen of other countries.

Determination of the effects of industrial development on marine resources

Alaska has 54% of the nation's coastline, 74% of its continental shelf, and a major part of the nation's resources. Industry is rapidly expanding in these coastal and offshore areas as large oil reserves, natural gas, timber, and minerals are being developed. Researchers are studying how pollution from two major industries in Alaska—logging as well as production and transport of crude oil—affects marine resources. Resource managers will use results from these studies to evaluate damage, if any, to marine resources and environments. Logging may change water flow, temperature, and sediment and cause bark accumulation in streams and estuaries. Studies in both the field and laboratory will determine which levels of petroleum hydrocarbons in seawater have a deleterious effect on eggs, larvae, and juvenile and adult stages of fish and shellfish. Studies are also underway to determine the accumulation, cycling, and fate of pollutants in Port Valdez, site of the terminus of the trans-Alaska pipeline.